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ABSTRACT

People sometimes forget a name or a word, and are plagued by the feeling that the sought-for word is somewhere in memory but not immediately available. The frequent description of this tip-of-the-tongue (TOT) phenomenon as subthreshold memory traces is challenged by data showing that TOT genesis and TOT recovery are distinct processes. In a verbal association learning experiment, one group of undergraduates studied word pairs by elaborating two words into a story or image, while a second group studied word pairs by frequent rapid repetition. The elaborate encoding strategy led to more intense feeling-of-knowing responses for those items that were not immediately recalled during the retrieval session. While encoding strategy is a strong predictor of TOT responses in paired-associate forgetting as compared to several estimates of response strength, neither factor influences the order in which hints cue retrieval. It is concluded that TOT's represent a failure of decoding processes in mediated retrieval. (Author/CTM)

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RESEARCH BULLETIN

MOMENTARY FORGETTING: ENTERING AND LEAVING THE TOT STATE

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Abstract

The frequent description of tip-of-the-tongue (TOT) states as subthreshold memory traces is challenged by data showing that TOT genesis and TOT recovery are distinct processes. While encoding strategy is a strong predictor of TOT activity in paired-associate forgetting as compared to several estimates of response strength, neither factor influences the order in which hints cue retrieval. It is concluded that TOTs represent a failure of decoding processes in mediated retrieval.

Momentary Forgetting: Entering and Leaving the TOT State

It sometimes happens that one will forget a person's name or the word for something and be plagued by the feeling that the sought-for word is somewhere in memory but somehow not immediately available. Typically one will have some idea as to what the lost word sounds like or what some of its component letters are, and inevitably there is a strong sense of frustration at not being able to get at a word which is so clearly there. Most often, in such instances, the forgotten word eventually comes to mind--apparently of its own accord. This familiar sort of retrieval failure has been labelled the tip-of-the-tongue phenomenon, and it has become of increasing interest to memory theorists in recent years. Unfortunately, many of the more intriguing aspects of the--let me call it "TOT"--phenomenon have been ignored in the majority of reported studies, and we actually have a very limited understanding of what we mean by momentary forgetting.

I believe that the reason for this problem lies in the fact that most studies of the TOT phenomenon have dealt with the validity of the individual's claim that he knows a word which he is unable to produce. Thus it has been shown that the first letter of the forgotten word is often known or that the word can be picked out of a set of other words. However, these observations tell us very little about what the TOT phenomenon represents. What I have been more interested in is the origin of the tip-of-the-tongue experience--

what can be described as the Problem of TOT Genesis: What are the factors that determine whether the forgetting of a particular piece of information will produce a TOT state?

Given that some words are more likely than others to occasion TOT reports when forgotten, and that some people seem to experience more TOT states than others, a good candidate for the role of TOT catalyst is encoding strategy. People vary in the sorts of strategies they use to encode information for later retrieval and words vary in their susceptibility to any particular encoding scheme. Given in addition that some theorists have argued that the internal representation of highly organized stimulus materials appears to be a kind of "opaque container" for the stored information, I decided to examine encoding strategies which varied in the degree of organization they required subjects to impose upon verbal stimuli. Thus I asked one group of undergraduates to study word pairs by elaborating two words into a story or image and a second group of undergraduates to link one word with another by repeating the two words to themselves as many times as possible during a brief interval. The procedure is outlined in Figure 1.

Insert Figure 1 about here

Subjects were first trained to make rapid judgments of the degree to which two words seemed to be associated. These judgments were made on a 4-point scale and were used as a measure of the strength of association at the time of encoding. Each subject then studied word pairs using either an elaborative encoding strategy or a rote rehearsal strategy. In the event that

the subject was unable to recall one word of a pair in response to the presentation of the other at a later session, he was asked to rate his feeling of knowing the forgotten word. These ratings were made on a 6-point scale and were used as a measure of the degree to which a subject felt himself to be in a tip-of-the-tongue state. Subjects were subsequently given very strong hints as to the identity of the forgotten word. These hints consisted either of a category of which the target word was a prominent exemplar or a stimulus word for which the target word was a highly likely free associate. If a hint successfully elicited a forgotten word, the position of the recovered target in the hint response list was recorded as a measure of the degree to which the word had actually been on the verge of being recalled.

The model of TOT genesis that is most often invoked suggests that the TOT state simply represents the retrieval of a weak memory trace and that factors which make for internal stimulus representations of greater or lesser strength will also influence the amount of TOT activity. One implication of this account is that subjects who are typically successful in their recall efforts will, when they do forget, access more intense stimulus representations than will subjects who are poor recallers. Good recallers should therefore report higher feeling-of-knowing ratings than poor recallers. Likewise, words that are easily recalled should, when they are forgotten, leave traces of somewhat greater intensity than should words that are difficult to recall. Easy words will then receive higher feeling-of-knowing ratings in the event of recall failure than will difficult words. Good recallers and easy words were identified by calculating correct recall frequencies from the response

protocols. Mean feeling-of-knowing ratings for individual words and for individual subjects were then entered into two-way analyses of variance with encoding strategy as one factor and overall response strength as the other. The entries in Table 1 are the percentages of variance accounted for by each factor in the analysis of variance. It is clear that response

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Insert Table 1 about here

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strength--as measured by recall frequency--is a powerful source of variance in the recall data, but not at all in the feeling-of-knowing ratings. Encoding strategy, on the other hand, proves to be an important determinant of TOT activity. As you might expect, it is the elaborative encoding strategy that leads to more intense feelings-of-knowing as indicated in Table 2.

Insert Table 2 about here

The integrity of the response strength or weak trace account can be preserved by arguing that the TOT state represents the recollection of a subject's judgment of trace strength at the time of encoding. Such a defense would account for the apparent failure of the response strength factor in the first set of data by insisting that a more subjective measure of response strength is required. Of course, it was for just this reason that subjects had been asked to judge the associative strength of word pairs at the time of encoding. For this analysis, word pairs were blocked into those judged to be extremely well associated and extremely poorly

associated, and the previous analysis was repeated to provide the results summarized in Table 3. It is apparent that this subjective measure of

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Insert Table 3 about here

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response strength predicts very little about TOT activity although it is a significant factor in recall performance. You will note that even when only the most extreme quartiles on the response strength dimension are considered, the association judgments remain useless as TOT predictors even though they become more powerful recall predictors.

A final defense for the weak trace model is that while response strength may have little to do with TOT genesis, it may still be an important variable insofar as the ultimate recovery of the lost information is concerned. Since we can calculate for each subject the average hint list position of elicited targets, we can determine whether this measure of TOT recovery is influenced by our original response strength measure--the recall performance of individual subjects. As it turns out, neither response strength nor encoding strategy appears to influence TOT recovery, although, as Table 4 demonstrates, we find that elicited targets for which tip-of-the-tongue reports had been made occur significantly earlier in the hint response

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Insert Table 4 about here

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lists. This result is strong evidence for the discriminant validity of the feeling-of-knowing ratings, but suggests that variables important for TOT genesis may have nothing whatsoever to do with TOT recovery.

Two things seem apparent from these data: the first is that the response strength hypothesis fares rather poorly--TOTs do not seem to depend on the degree to which an item is recallable--a very different process appears to be involved. The second conclusion is that elaborative encoding seems to make internal stimulus representations especially prey to TOT reports when forgetting occurs. Let me indicate why this might be the case.

An initial step is to conceptualize the difference between elaborative encoding and rote rehearsal in a useful way. My own suggestion is that elaborative encoding simply produces a more highly transformed internal representation of stimulus materials than does rote rehearsal. Luby Prytulak (1971) has put forth a rather detailed description of the process by which nonsense syllables are transformed into subjectively meaningful items, and I would like to extend that model to this situation in order to show how we might describe what the TOT state represents.

An important notion in Prytulak's scheme is that a sequence of discrete transformations is applied to presented stimulus materials during the encoding process. The essential difference, as indicated in Figure 2, between the two

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Insert Figure 2 about here

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encoding strategies is that many more transformations are applied in the elaborative encoding condition. Prytulak's second critical proposition is that the retrieval process involves the accessing of the stored internal representation and its subsequent transformation back into the original stimulus array. A key feature of this process is that portions of this

transformational recipe may be forgotten and the internal representation may prove undecodable. This state of the memory system bears more than a passing resemblance to the tip-of-the-tongue state, and I would like to argue that they are one and the same.

If you will consider the decoding sequence on the right of Figure 2, you will note that until the retrieval cue makes contact with the stored internal representation, there is no basis for a TOT claim on the subject's part because nothing has been accessed. However, once the coded representation has been accessed, there is indeed something on the tip-of-his-tongue--the memory code for the as-yet-unrecalled word. To the degree that some portion of the decoding sequence takes place, some features of a word may be identifiable even if complete recall is not possible. Since the assumption must be that the breakdown in the decoding sequence occurs for the lack of a particular transformation, it should be the case that TOT recovery consists in the discovery and application of that transformation to the still available internal memory code. It can also be seen why the presentation of a forgotten word to a TOT victim proves to be such an AHA! experience. The presence of the word provides a basis for redintegrating the original memory plan; it is this rediscovery of that organizational scheme that is sought in the TOT state rather than the physical form of the word. It seems reasonable that a subject will not "recognize" a TOT target unless this redintegration takes place. In fact, there are several instances in the literature where such recognition failures have occurred.

In summary, my claim is that many aspects of the tip-of-the-tongue experience seem explicable and extremely intriguing in light of the decoding failure model I have described here. What I think will prove most interesting as a focus for future studies is the issue as to why a breakdown of this system proves to be so irritatingly distracting--it is not at all clear to me why forgetting what is usually a trivial piece of information should be so frustrating. A clear explanation of that aspect of TOT states might well provide some fundamental insights into the nature of motivational processes in general.

Reference

Prytulak, L. S. Natural language mediation. Cognitive Psychology, 1971, 2, 1-56.

Footnote

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Table 1

Percentage of Variance Accounted for by Encoding Strategy (E) and Level of Recall (RL) in Frequency of Correct Recall and in Mean Feeling-of-Knowing Ratings of Individual Subjects/Items

Source of Variance in ANOVA	Individual Subjects		Individual Items	
	Recall Data	FOK Data	Recall Data	FOK Data
E	40.5^{***}	13.3^{**}	28.7^{**}	18.7^{***}
RL	34.3^{***}	$6.4^{n.s.}$	50.7^{***}	6.4^{*}
E x RL	$1.3^{n.s.}$	0.0	3.8^{***}	0.0

$^{*}p < .05$

$^{**}p < .025$

$^{***}p < .001$

Table 2

Mean Feeling-of-Knowing Ratings for Nonrecalled Items as a Function of Encoding Strategy and an Individual's Overall Recall Skill or an Item's Overall Recallability

Overall Recall Level	Individual Subjects		Individual Items	
	Elaboration	Rehearsal	Elaboration	Rehearsal
High	3.76 (0.92)	2.98 (0.52)	3.42 (0.42)	2.97 (0.57)
Low	3.12 (0.61)	2.76 (0.46)	3.14 (0.45)	2.60 (0.52)
Combined	3.44	2.87	3.28	2.78

Feeling-of-Knowing Scale	
1 2 3	4 5 6
no TOT	yes TOT

Table 3

Percentage of Variance Accounted for by Encoding Strategy (E) and Associative Strength (AS) in Frequency of Correct Recall and in Mean Feeling-of-Knowing Ratings of Individual Items

Source of Variance in ANOVA	Extreme Groups Analyses			
	AS = Top 50%/Bottom 50%		AS = Top 25%/Bottom 25%	
	Recall Data	FOK Data	Recall Data	FOK Data
E	46.6***	13.2***	44.5***	17.0**
AS	6.7**	2.9n.s.	14.7**	1.1n.s.
E x AS	0.0	0.0	0.4n.s.	0.0

*p < .05

**p < .025

***p < .001

Table 4

Mean Position in Hint Response List of Elicited Targets as a Function of the Encoding Strategy, Recall Level, and TOT Report of Individual Subjects

Overall Recall Level	Elaboration		Rehearsal	
	yes TOT	no TOT	yes TOT	no TOT
High	1.59 (0.33)	1.89 (0.37)	2.01 (0.41)	2.15 (0.48)
Low	1.76 (0.48)	1.97 (0.41)	1.70 (0.37)	1.96 (0.20)
Combined	1.67	1.93	1.86	2.05

Feeling-of-Knowing Scale					
1	2	3	4	5	6
no TOT			yes TOT		

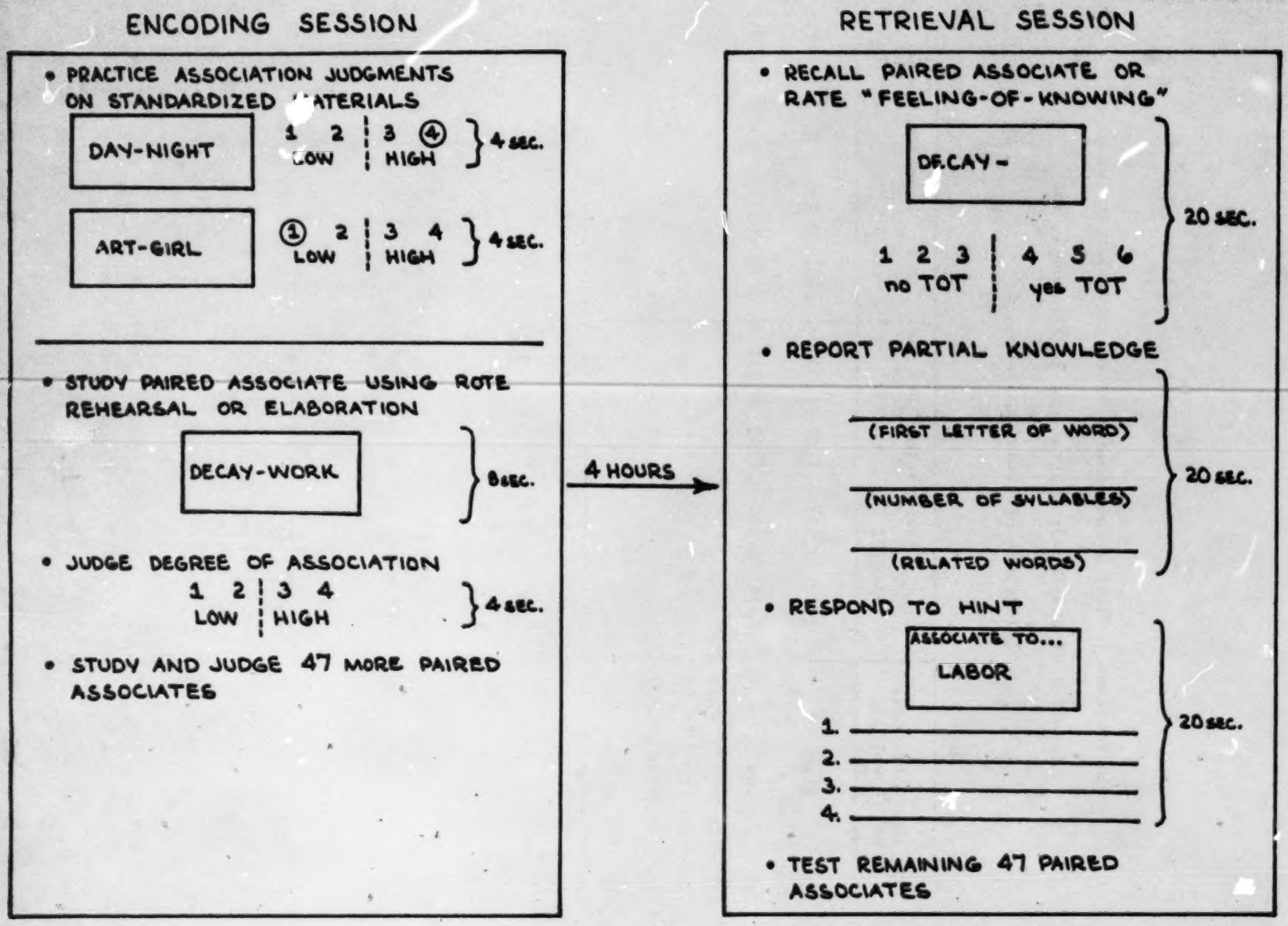
ENCODING SESSION
• PRACTICE ASSOCIATION JUDGMENTS ON STANDARDIZED MATERIALS
DAY-NIGHT
1 2 | 3 (4)
LOW | HIGH
4 SEC.
ART-GIRL
(1) 2 | 3 4
LOW | HIGH
4 SEC.
• STUDY PAIRED ASSOCIATE USING ROTE REHEARSAL OR ELABORATION
DECAY-WORK
8 SEC.
• JUDGE DEGREE OF ASSOCIATION
1 2 | 3 4
LOW | HIGH
4 SEC.
• STUDY AND JUDGE 47 MORE PAIRED ASSOCIATES
4 HOURS
RETRIEVAL SESSION
• RECALL PAIRED ASSOCIATE OR RATE "FEELING-OF-KNOWING"
DECAY-
1 2 3 | 4 5 6
no TOT | yes TOT
20 SEC.
• REPORT PARTIAL KNOWLEDGE
(FIRST LETTER OF WORD)
(NUMBER OF SYLLABLES)
(RELATED WORDS)
20 SEC.
• RESPOND TO HINT
ASSOCIATE TO...
LABOR
1.
2.
3.
4.
20 SEC.
• TEST REMAINING 47 PAIRED ASSOCIATES

Figure 1

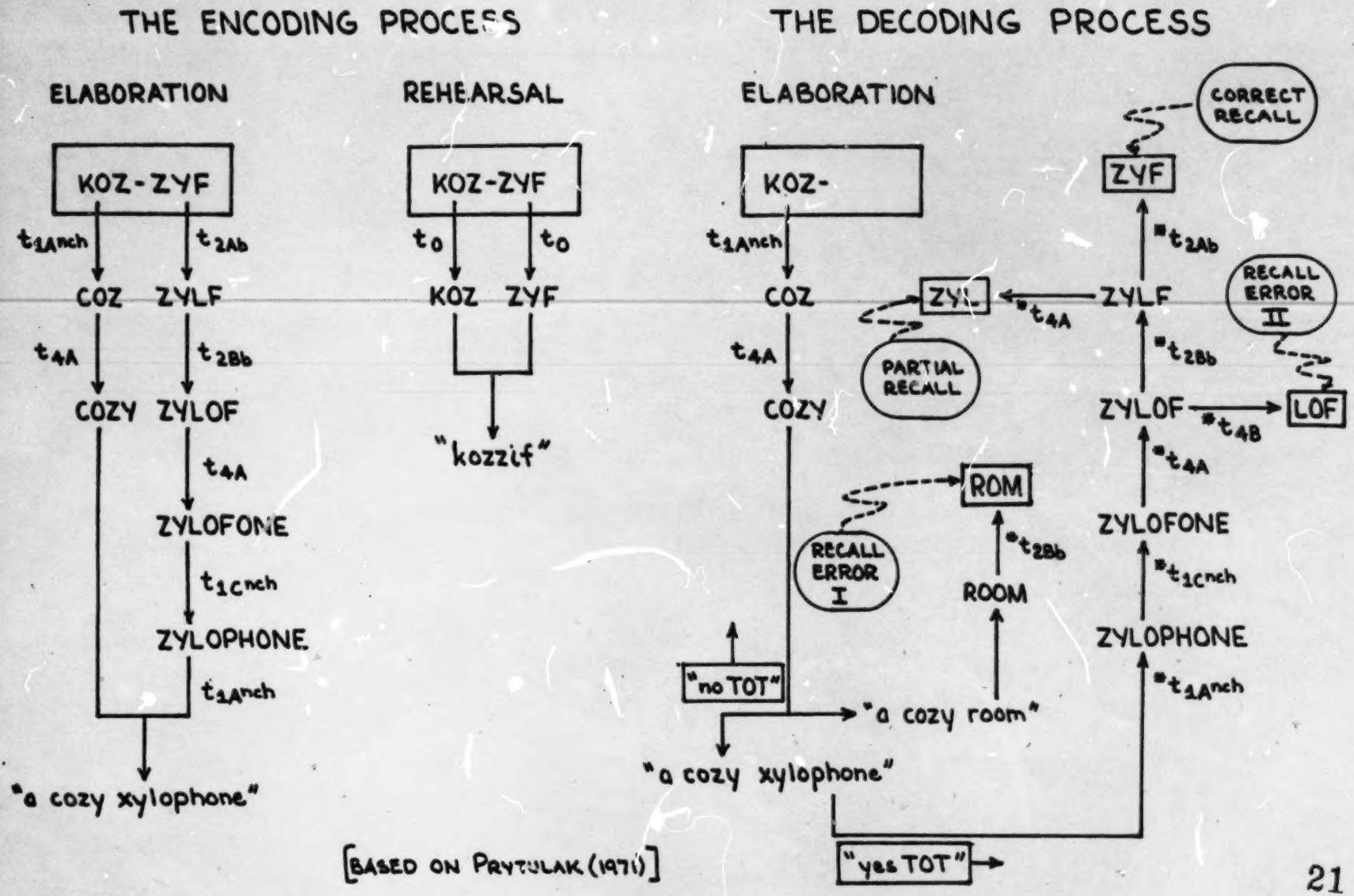
THE ENCODING PROCESS
ELABORATION
KOZ-ZYF
t1Anch
t2Ab
COZ
ZYLF
t4A
t2Bb
COZY
ZYLOF
t4A
ZYLOFONE
t1Cnch
ZYLOPHONE
t1Anch
"a cozy xylophone"
REHEARSAL
KOZ-ZYF
t0
t0
KOZ
ZYF
"kozzif"
THE DECODING PROCESS
ELABORATION
KOZ-
t1Anch
COZ
t4A
COZY
"no TOT"
"a cozy xylophone"
ZYL
*t4A
PARTIAL RECALL
RECALL ERROR I
ROM
*t2Bb
ROOM
"a cozy room"
"yes TOT"
CORRECT RECALL
ZYF
*t2Ab
ZYLF
RECALL ERROR II
*t2Bb
ZYLOF
LOF
*t4B
*t4A
ZYLOFONE
*t1Cnch
ZYLOPHONE
*t1Anch
[BASED ON PRYTULAK (1971)]

Figure 2